



[10191/899]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:

Theodor GRASER et al.

For: METHOD FOR MANUFACTURING
A SENSING ELEMENT

Filed: March 31, 1999

Art Unit: 1731

Serial No.: 09/194,773

Assistant Commissioner
for Patents
Washington, D.C. 20231

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APPEAL BRIEF PURSUANT TO 37 C.F.R. § 1.192(a)

SIR:

In the above-identified patent application ("the present application"), Appellants mailed a Notice Of Appeal on January 10, 2001 (which was received by the Patent Office on January 16, 2001) from the Final Office Action issued by the U.S. Patent and Trademark Office on October 10, 2000. In the Final Office Action, claims 13, 14 and 24 were finally rejected, and claims 15 to 23 were objected to. An Advisory Action was mailed on December 21, 2000.

In accordance with 37 C.F.R. § 1.192(a), this Appeal Brief is being submitted in triplicate in support of the appeal of the final rejections of claims 13, 14 and 24. Since the Office has only objected to claims 15 to 23 as depending from a rejected claim(s) and are otherwise allowable, these claims are still pending. For the reasons set forth below, it is respectfully submitted that the final rejections of claims 13, 14 and 24 should be reversed.



APPENDIX

13. (Twice Amended) A method for manufacturing a sensing element for determining oxygen content in exhaust gases of an internal combustion engine, comprising the steps of:

blunting edges of a composite arrangement for use as the sensing element to increase a thermal shock resistance of the sensing element; and

sintering the composite arrangement to yield the sensing element, the composite arrangement including at least one ceramic paste present in film form.

14. (Amended) The method according to claim 13, wherein the step of blunting includes the step of blunting the edges of the composite arrangement by shaping.

24. The method according to claim 13, wherein the step of blunting further includes the step of producing a chamfer on the edges having at least one of a convex surface, a concave surface and a flat surface.

1. REAL PARTY IN INTEREST

The real party in interest in the present appeal is Robert Bosch GmbH ("Robert Bosch") of Stuttgart in the Federal Republic of Germany. Robert Bosch is the assignee of the entire right, title and interest in the present application.

2. RELATED APPEALS AND INTERFERENCES

There are no interferences or other appeals related to the present application, which "will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal".

3. STATUS OF CLAIMS

Claims 13, 14 and 24 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over Kurishita et al., U.S. Patent No. 5,144,249, in view of Nenadic et al., U.S. Patent No. 5,871,313.

A copy of the appealed claims is attached hereto in the Appendix. Claims 15 to 23 are not listed since they were only objected to as depending from a rejected claim(s) and are otherwise allowable.

4. STATUS OF AMENDMENTS

In response to the Final Office Action issued on October 10, 2000, Appellants filed an Amendment After A Final Office Action ("the Amendment After Final"), which was mailed on December 7, 2000 (and filed on December 12, 2000).

5. SUMMARY OF THE INVENTION

An exemplary method of the present invention is directed to a method for manufacturing a sensing element for determining the oxygen content in an exhaust gas of an internal combustion engine. (See Specification, page 1, lines 1 to 3).

With respect to an exemplary embodiment, Figure 1 shows a section of a sensing element 10 for determining an oxygen content, for example, in exhaust gases of internal combustion engine. As shown in Figure 1, the sensing element 10 includes an electrochemical measurement cell 12 and a heating element 14. The measurement cell 12 includes a first solid electrolyte film 16 and a second solid electrolyte film 18, which has an

integrated reference gas conduit 20. A measurement electrode 22 is associated with a measured-gas-side surface of an electrolyte film 16, and a reference electrode 24 is associated with the surface associated with the reference gas conduit 20. A porous cover layer 26 is arranged above measurement electrode 22. (See id. at page 5, line 17 to page 6, line 6).

The heating element 14 has heating conductors 32 embedded in insulation layers 28 and 30, and adjacent to insulation layer 30 is a further cover layer 34. The solid electrolyte films 16 and 18 and cover layer 34 may be made using a stabilized zirconium oxide (ZrO_2). The electrodes 22 and 24 and heating conductors 32 may be made of a platinum cermet. The insulation layers 28 and 30 may be made of a mixture of aluminum oxide (Al_2O_3) and glass-forming components. The entire composite construction of individual layers has, when viewed in cross section, an approximately parallelepipedal configuration, in which at least edges 36 run in a longitudinal direction of the sensing element having a chamfer 38. (See id. at page 6, lines 8 to 23).

The sensing element 10 is made by successively laminating the individual layers onto cover layer 34, which constitutes a support. The layers may be defined by screen printing a paste material having the respective composition of the layer. After completing this lamination, there results a composite construction of so-called green films of the individual layers having a relatively soft consistency. The composite construction is then subjected to a sintering operation. According to an exemplary embodiment, provision is now made, before sintering, for patterning chamfers 38 of edges 36. (See id. at page 6, line 25 to page 7, line 9).

Figure 2 shows a portion of a panel of a plurality of sensing elements 10 present in the green state. The individual layers of sensing elements 10 are laminated simultaneously for a plurality of sensing elements 10, and the composite construction of green films for one sensing element 10 is then sectioned out. After lamination, cutting lines 40 are defined by which the sensing elements 10 may be sectioned. Prior to sectioning the sensing elements 10, a surface depression 42 may be introduced at cutting lines 40 by using an excimer laser 44 having a specific mask. Figure 3 shows two exemplary masks. According to the left-hand depiction, the excimer laser 44 may use a triangular mask so that surface depressions 42 are triangular in accordance with this depression. According to the other exemplary embodiment depicted in Figure 3, the mask can also have delimiting surfaces extending in a concave fashion. Other exemplary embodiments may exhibit mixed forms of planes running at various angles and/or concave and/or convex delimiting surfaces. (See id. at page 7, line 13

to page 8, line 7).

Figure 4 shows that the excimer laser 44 is "moved along" the surface of the composite construction of green films. For this purpose, the excimer laser 44 may be movable, and/or the green films may be moved past the excimer laser 44. The surface depression 42 is patterned in terms of its depth and feed rate in accordance with the output setting of excimer laser 44. The patterning of the surface depressions 42 yields blunted edges 36 with their chamfers 38. The sensing elements 10 are then sectioned along cutting lines 40, and are then subjected to the sintering operation. The sensing element 10 shown in cross section in Figure 1 is then provided. Because the chamfers 38 are patterned while the films of sensing element 10 are in the green state and because of the noncontact patterning with the excimer laser 44, the sensing element 10 is not believed to be subject to any significant mechanical stress and resulting damage. (See id. at page 8, lines 9 to 24).

In Figure 5, a sensing element 10 is acted upon by a stamping apparatus 45 after sectioning of the composite construction of green films. The stamping apparatus 45 has a contour 46 allowing the shaping of edges 36 so that they exhibit chamfers 38. Depending on the shaping of the contour 46, the chamfer 38 may have a different contour as a result of stamping (such as planar and/or convex and/or concave sections). The contour 46 of stamping apparatus 45 may be provided either by manufacturing a corresponding stamping apparatus 45, or by laying a stamping film 48 into stamping apparatus 45. The stamping film 48 may be equipped with an anti-adhesion coating, such as Teflon or titanium nitride. Since the green films still have a relatively soft consistency in the case of this shaping as well, it is believed that the chamfers 38 may be easily stamped in without causing impairment to the prefabricated sensing element 10. (See id. at page 9, lines 3 to 19).

Figure 6 shows another exemplary embodiment in which a composite construction of sensing elements 10 is stamped, where the stamping apparatus 45 includes a stamping contour 50 exhibiting projections 52 corresponding to depressions 42. The stamping contour 50 may include an anti-adhesion coating. With the exemplary embodiment of Figure 6 a plurality of sensing elements 10 in a multiple panel may be stamped in one stamping step. The stamping apparatus 45 may include an upper die 54 and a lower die 56 so that the upper and lower sides of sensing elements 10 may be stamped simultaneously in one process step. Because of the relatively soft consistency of the as-yet unsintered sensing elements 10, surface depressions 42 may be stamped using little energy expenditure to prevent better any

damage to the structure of the sensing elements 10. When chamfers 38 are patterned using either excimer laser 44 or with the stamping apparatus 45, both sides of the sensing element 10 are processed. Accordingly, either an apparatus acting in double-sided fashion may be used, or the green film composite construction of the sensing elements 10 may be turned over. (See id. at page 9, line 21 to page 10, line 15).

In summary, the configuration of chamfers 38 in various contours, which is believed to be desirable to increase the temperature shock resistance of the sensing element 10, can be effected using the above methods. It is also believed that the outlay for tooling is relatively low, and since the tooling is subject essentially to no wear, long service lives may be expected. Also, the additional use of consumable materials, such as, for example as with the grinding of the sintered sensing element 10 may at least be reduced. (See id. at page 10, lines 17 to 26).

In summary, the present invention is directed to a method for manufacturing a sensing element for determining oxygen content in exhaust gases of an internal combustion engine, including the steps of blunting edges of a composite arrangement for use as the sensing element to increase a thermal shock resistance of the sensing element, and sintering the composite arrangement to yield the sensing element, the composite arrangement including at least one ceramic paste present in film form. (See claim 13).

6. ISSUES

Under 35 U.S.C. § 103(a), are claims 13, 14 and 24 patentable over Kurishita in view of Nenadic.

7. GROUPING OF CLAIMS

Group 1: Claims 3, 14 and 24 stand or fall together.

8. ARGUMENT

Claims 13 to 24 are now pending, of which claims 15 to 23 have been objected to and of which claims 13, 14 and 24 have been finally rejected.

With respect to paragraph one (1) of the Final Office Action, claims 13 to 24 were rejected under the second paragraph of 35 U.S.C. § 112 as indefinite. Based on the Advisory Action, these rejections have now been withdrawn.

As to claims 15 to 23, the Examiner has only objected to these claims and has indicated that claims 15 to 23 contain allowable subject matter, and that these claims would be allowed if rewritten to overcome the indefiniteness rejections and to reflect the base claim and any intervening claim. In this regard, it is again respectfully submitted that claim 15 is now allowable since it has been previously rewritten to reflect claim 13 (as presented) and claim 14. As regards claims 16 to 23, it is respectfully submitted that these claims are allowable as presented for the reasons discussed herein with respect to claim 13. Accordingly, claim 15 should now be allowed and claims 16 to 23 remain objected to as depending from a rejected claim.

Claims 13, 14 and 24 were rejected under 35 U.S.C. § 103(a) as unpatentable over Kurishita in view of Nenadic.

As regards Nenadic, it purportedly concerns a cutting assembly and an apparatus and method for self-aligned chamfering of a “Controlled Collapsed Chip Connector (C4) ball grid array (BGA) multilayer ceramic (MLC) package” workpiece, in which the chamfering apparatus includes a mechanism for releasably securing the workpiece for preparing to chamfer the workpiece, a cutting assembly, and a mechanism for moving the cutting assembly proximately with respect to the securing mechanism between a first position and a second position, in which the cutting assembly traverses along an edge portion of the workpiece to be chamfered. As stated, the cutting assembly includes: (i) a guide member having a guide surface; (ii) a blade member mechanically coupled with respect to the guide surface for establishing a desired cutting depth; (iii) a mechanism for applying a resilient tensioning force to the guide member, the “resilient tensioning means” applying a first tensioning force when the guide member is in a non-chamfer engaging position and applying a second tensioning force when the guide member is in a chamfer engaging position, the chamfer engaging position corresponding to a position of the guide member when the guide surface engages the portion of the workpiece to be chamfered; and (iv) a mechanism for locking the guide member to maintain the chamfer engaging position and the desired cutting depth subsequent to the guide surface no longer being in contact with the workpiece.

As further stated, the apparatus and method of the reference relied upon is directed to addressing the cracking problem caused by “fixture off” handling and/or processing. In particular, the Nenadic reference states that:

The smaller size of the ceramic chip carrier presents several problems. One such problem is not having an ability to chamfer both the edges 12 and the corners 14 (FIG. 1) of a ceramic substrate 10 in a reliable and repeatable manner with low loss yields. Corner and edge chamfers are required for both aesthetic reasons as well as for yield purposes. For instance, a sharp ceramic edge is very brittle and vulnerable to chipping and cracking. *During semiconductor chip device packaging processes, plating and bond & assembly processes typically fixture off (i.e., reference from) the substrate sides. As a result of fixturing off of the substrate sides, there are usually high yield losses associated with non-chamfered edges.* The problem is further complicated by tighter spacings between the substrate side and the active metallurgy of the package which results in less room for the chamfer. . . .

The chamfer tools presently used to chamfer PGA product are not suitable for BGA chamfering since the chamfer size which results from use of those tools will vary with the tolerance on the X-Y size and thickness (i.e., as a result of fixed cutter positions). Furthermore, the parts to be chamfered are typically moved, flipped and rotated several times in order to achieve 8 edge chamfers and 4 corner chamfers using such known chamfer tools. Increased handling of a substrate can be a cause for major yield problems in the chamfering of much thinner packages, also.

(See Nenadic, col. 1, lines 31 to 64) (emphasis added).

As regards Kurishita, it purportedly concerns a formed oxygen sensor, in which chamfering is applied to ridges formed parallel to the lengthwise direction of the already formed oxygen sensor element which is exposed to the gas to be measured. (See Kurishita, Abstract). Accordingly, this reference discloses no more information than is discussed in the Background Information of the present application, as referred to below.

In contrast, the subject matter of claim 13 is directed to addressing the entirely different problem of excessive heat causing cracking in the sensor element, which is used in relatively high temperature automotive applications. In this regard, the present application discusses, for example, the problem and the solution as follows:

During testing of the sintered sensing element, or during utilization thereof as intended, the individual layers of the sensing element are exposed to different temperatures. Because of these sudden temperature changes which occur with differing intensity, the sensing elements experience a

temperature shock which leads to the occurrence of mechanical stresses in the surface region, in particular at the edges of the sensing element. [To] increase the temperature shock resistance of the sensing elements, . . . the edges of the sensing element [may be blunted or chamfered]. . . .

The [exemplary] method . . . offers, in contrast, the advantage that blunting of the edges of the sensing element can be accomplished in a simple manner without the risk of impairing the sensing element. Because the edges of the sensing element are blunted prior to sintering, it is possible to blunt the edge in any desired geometry using simple, non-chip-removing methods. In particular, a blunting of the edges can be accomplished in a form deviating from a flat surface, for example in a convex or concave form, so that mechanical stresses which occur as a consequence of a temperature shock to the blunted edges cannot result in the creation of cracks.

(See Specification, page 2, line 1 to page 3, line 3) (emphasis added).

Accordingly, it is respectfully maintained and submitted that Nenadic is plainly a non-analogous reference with respect to the presently claimed subject matter, and therefore cannot be relied on to reject the claims under 35 U.S.C. § 103(a). To rely on a reference for the purpose of rejecting the presently claimed subject matter, the reference must be in either the field of the claimed subject matter or it must be reasonably pertinent to the particular problem with which the inventors were concerned. (See M.P.E.P. § 2141.01(a)). That is not the case here.

It is respectfully submitted that the Nenadic reference is plainly not in the field of the claimed subject matter and is therefore directed to addressing the entirely different problem of cracking caused by “fixture off” handling in electronic substrates, and therefore simply does not concern the problem of sensor elements that may experience cracking due to high temperatures, which as discussed above is the problem that is addressed by the presently claimed subject matter. Thus, Nenadic is simply not in the field of the presently claimed subject matter. Additionally, the Nenadic reference is not reasonably pertinent to the particular problem relating to the presently claimed subject matter for the foregoing reasons. The Final Office Action and the Advisory Action do not really address these facts in any way.

Accordingly, it is respectfully submitted that there is no motivation to combine or modify the Kurishita in view of the Nenadic reference.

Moreover, to reject a claim as obvious under 35 U.S.C. § 103, the prior art must disclose or suggest each claim element and it must also suggest combining the elements in the manner contemplated by the claim. (See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), cert. denied, 111 S. Ct. 296 (1990); In re Bond, 910 F.2d 831, 834 (Fed. Cir. 1990)). Thus, the “problem confronted by the inventor must be considered in determining whether it would have been obvious to combine the references in order to solve the problem.” (See Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 679 (Fed. Cir. 1998)). It is respectfully submitted that the references relied on, whether taken alone or otherwise, do not suggest in any way combining the references so as to address the problems that are met by the presently claimed subject matter for the reasons discussed above.

As further regards the obviousness rejections, the cases of In re Fine, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988), and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), also make plain that the Final Office Action’s assertions that the claims would have been obvious based on the reference relied upon does not properly support a § 103 rejection. It is respectfully suggested that those cases make plain that the Final Office Action reflects a subjective “obvious to try” standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the references relied upon. In particular, the Court in the case of In re Fine stated that:

Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . .

One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

In re Fine, 5 U.S.P.Q.2d at 1600 (citations omitted; emphasis added). Likewise, the Court in the case of In re Jones stated that:

Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].

In re Jones, 21 U.S.P.Q.2d at 1943 & 1944 (citations omitted; italics in original).

That is the case here, since it is respectfully submitted that the Final Office Action offers no evidence whatsoever, but only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. In short, it is respectfully submitted that there is no evidence whatsoever -- except subjective speculation -- that the references relied upon makes obvious all of the features discussed above of claim 13, as well as its respective dependent claims 14 and 24, as discussed above. It is therefore respectfully submitted that all rejected claims 13, 14 and 24 are allowable for these further reasons -- like allowable claims 15 to 23.

Still further, it is respectfully submitted that not even a *prima facie* case has been made in the present case for obviousness, since the Office Actions to date never made any findings, such as, for example, regarding in any way whatsoever what a person having ordinary skill in the art would have been at the time the claimed subject matter of the present application was made. (See *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998) (the “factual predicates underlying” a *prima facie* “obviousness determination include the scope and content of the prior art, the differences between the prior art and the claimed invention, and the level of ordinary skill in the art”)). It is respectfully submitted that the proper test for showing obviousness is what the “combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art”, and that the Patent Office must provide particular findings in this regard -- the evidence for which does not include “broad conclusory statements standing alone”. (See *In re Kotzab*, 55 U.S.P.Q. 2d 1313, 1317 (Fed. Cir. 2000) (citing *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1618 (Fed. Cir. 1999) (obviousness rejections reversed where no findings were made “concerning the identification of the relevant art”, the “level of ordinary skill in the art” or “the nature of the problem to be solved”))). It is respectfully submitted that there has been no such showings by the Office Actions to date or by the Advisory Action.

In fact, the present lack of any of the required factual findings forces both Appellants and this Board to resort to unwarranted speculation to ascertain exactly what facts underly the present rejections. The law mandates that the allocation of the proof burdens requires that the Patent Office provide the factual basis for rejecting a patent application under 35 U.S.C. § 103. (See *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984) (citing *In re Warner*, 379 F.2d 1011, 1016, 154 U.S.P.Q. 173, 177 (C.C.P.A. 1967))). In

short, the Examiner bears the initial burden of presenting a proper prima facie unpatentability case -- which he has wholly failed to do in the present case. (See In re Oetiker, 977 F.2d 1443, 1445, 24, U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992)).

Accordingly, it is respectfully submitted that claim 13 and its dependent claims 14 and 24 are allowable over the references relied upon for these reasons (like claims 15 to 23 which were only objected to but which are otherwise allowable).

It is therefore respectfully submitted that the rejected claims 13, 14 and 24 are allowable over the references relied upon in the Final Office Action.

CONCLUSION

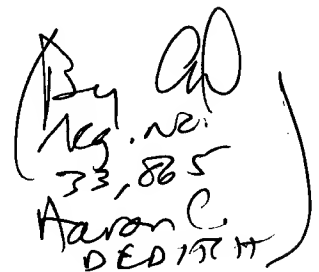

In view of the above, it is respectfully requested that the rejections of claims 13, 14 and 24 be reversed, and that claims 13, 14 and 24 be allowed as presented (together with allowable claims 15 to 23).

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Respectfully submitted,

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